



# **Draft Explorer 2010 Announcement of Opportunity and Technical, Management, and Cost Evaluation**

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Explorer Workshop

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# Introduction

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## **Purpose of this Presentation**

1. Present to the community the Draft Explorer 2010 Announcement of Opportunity (AO) highlighting the “Feasibility of the Mission Implementation, Including Cost Risk” criteria and requirements that are assessed by the Technical, Management and Cost (TMC) panel.

2. Answer questions.

Important Note: This AO incorporates a large number of changes relative to previous Explorer Program AOs including both policy changes and changes to proposal submission requirements. All proposers must read this AO carefully, and all proposals must comply with the requirements, constraints, and guidelines contained within this AO.



# Introduction

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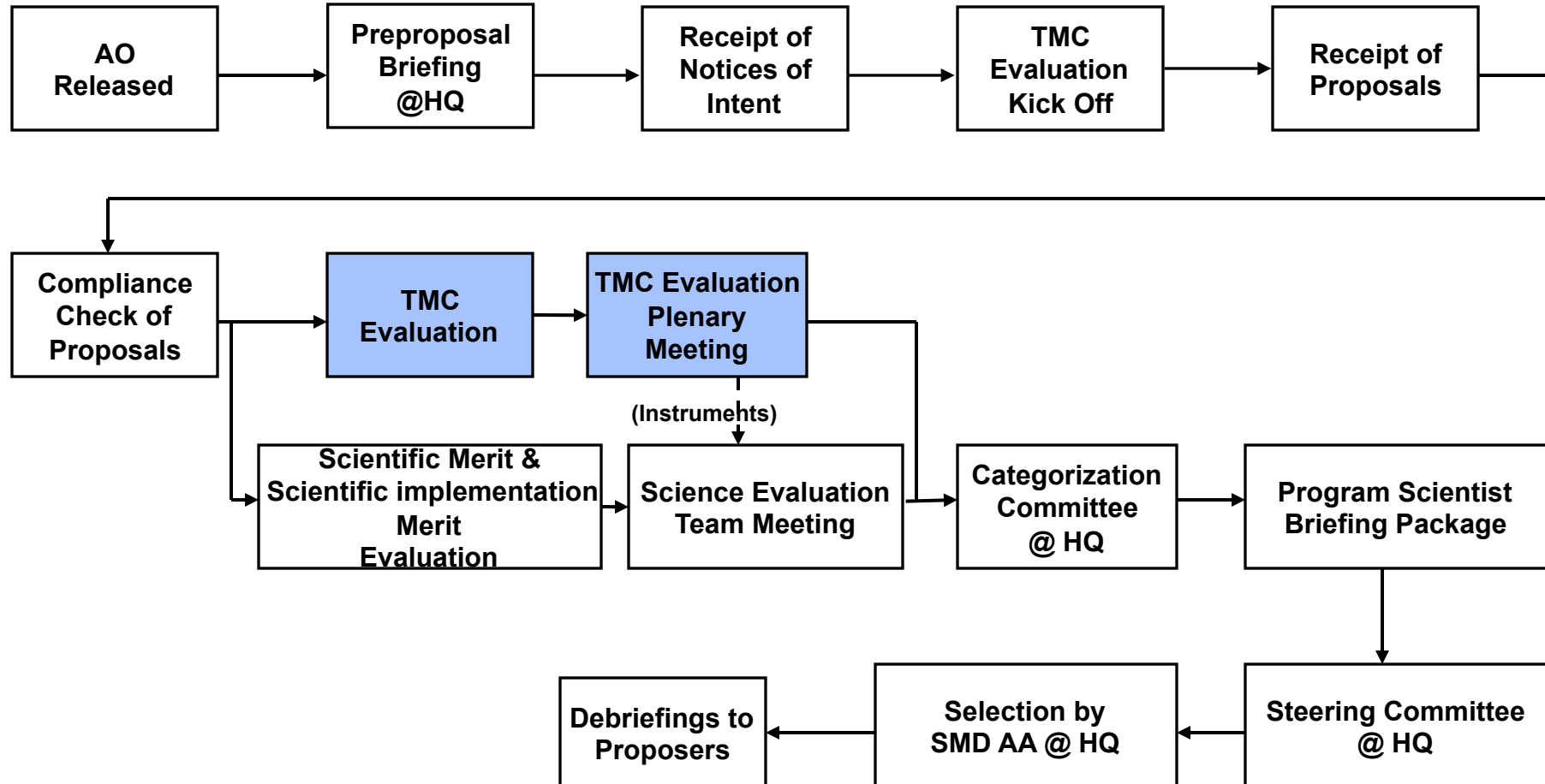
## Outline

- Purpose
- Technical, Management, and Cost (TMC) Evaluation
- Draft Explorer 2010 AO Highlights
- References
- Questions



# Introduction

## Proposal Evaluation Process





# TMC Evaluation

The **NASA Science Mission Directorate (SMD) Science Office for Mission Assessments (SOMA)** was established in 1996 by the Office of Space Science to support the Discovery and Explorer Programs, now also supports the New Frontiers, Mars Scout, Earth System Science Pathfinder (ESSP), and others. The TMC process is a standard process used by SOMA to support all SMD evaluations. Lessons learned from each evaluation are incorporated into the process for continuous improvement.

**TMC Evaluation** - The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule.

## There are three possible Risk Ratings: Low, Medium, and High

**Low Risk:** There are no problems evident in the proposal that cannot be normally solved within the time and cost proposed. Problems are not of sufficient magnitude to doubt the Proposer's capability to accomplish the investigation well within the available resources.

**Medium Risk:** Problems have been identified, but are considered within the proposal team's capabilities to correct within available resources with good management and application of effective engineering resources. Mission design may be complex and resources tight.

**High Risk:** One or more problems are of sufficient magnitude and complexity as to be deemed unsolvable within the available resources.



# TMC Evaluation

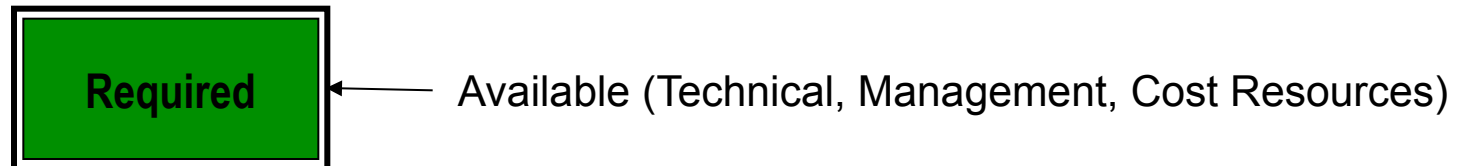
## TMC Envelope Concept

**Envelope:** All TMC Resources available to handle known and unknown development problems that occur. Includes schedule and funding reserves; reserves and margins on physical resources such as mass, power, and data; descope options; fallback plans; and personnel.

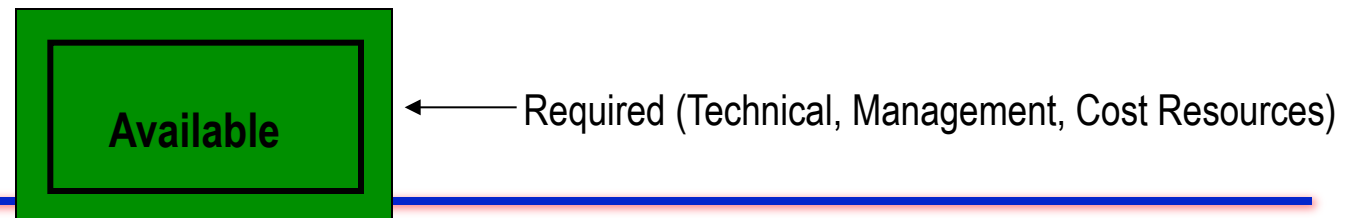
**Low Risk:** Required resources fit well within available resources



**Medium Risk:** Required resources just barely inside available resources.  
Tight, but likely doable

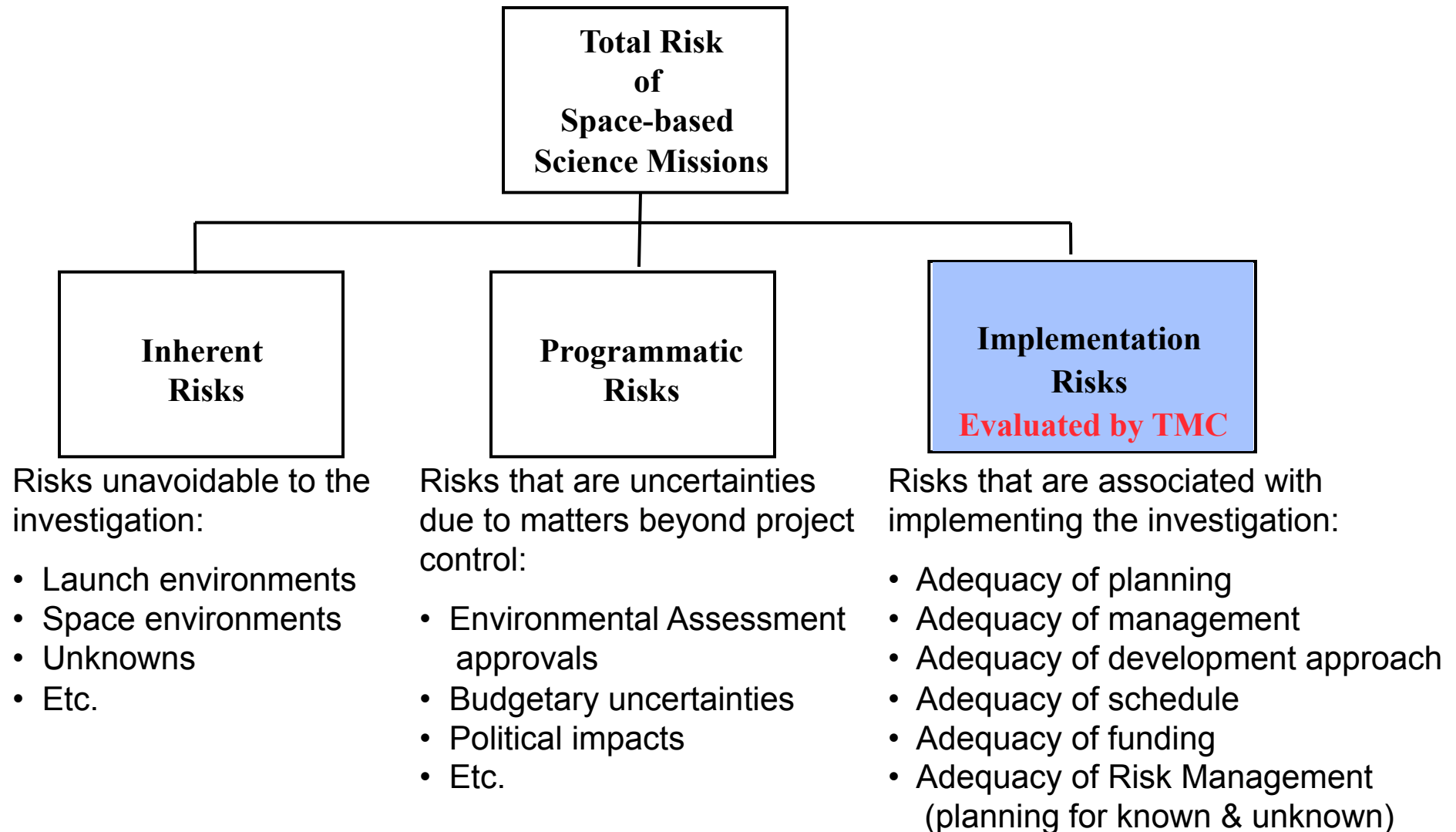


**High Risk:** Required resources DO NOT fit inside available resources.  
Expect project to fail





# TMC Evaluation





# TMC Evaluation

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## TMC Evaluation Principles

- **Basic Assumption:** Proposer is the expert on his/her proposal.
  - Proposer's task is to provide evidence that the investigation implementation risk is low.
  - TMC panel's task is to try to validate proposer's assertion of low risk.
- **All Proposals are evaluated to identical standards and not compared to other proposals.**
- **TMC Panels consist of evaluators who are experts in the areas of the proposals that they evaluate.**
- **TMC Panels develop consensus findings for each proposal.**
  - Findings: "As expected" (no finding), "above expectations" (strengths), "below expectations" (weaknesses).
- **The Cost Analysis is integrated into overall risk.**
- **Step-One Proposal Risk Assessment:**
  - Step-One proposals are based on Pre-Phase-A concepts; TMC Risk Assessments give appropriate benefit of the doubt to the Proposer.





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## **General**

- This Draft Explorer 2010 AO is based on the Standard AO template.
- Requirements are identified, numbered, and specific.
  - There are 85 requirements on the Draft Explorer AO
  - When Sections do not levy requirements they do not have numbered requirements.
  - In Section 4 it is stated– “The following policies will impose requirements on selected missions, for which planning may need to be considered and described as part of the proposal process. These requirements are not levied on Step 1 proposals.”
- Evaluation Factors are identified, numbered, and specific.
  - 4 for Science Merit
  - 6 for Scientific Implementation Merit and Feasibility
  - 5 for Feasibility of the Mission Implementation, Including Cost Risk
- Appendix B has numbered requirements on Proposal Preparation
  - There are 69 specific requirements for the format and content of Step 1 proposals



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## **Example Requirement**

### 5.2 Technical Requirements

#### *5.2.1 Complete Spaceflight Missions*

The term “complete” encompasses all appropriate mission phases (see Section 4.1) from project initiation (Phase A) through mission operations (Phase E), which must include analysis and publication of data in the peer reviewed scientific literature, delivery of the data to an appropriate NASA data archive, and, if applicable, extended mission operations or other science enhancements (see Section 5.1.5) and closeout (Phase F). The term “spaceflight missions” is defined as Earth orbital and deep-space missions; it specifically excludes suborbital missions (*e.g., via sounding rockets, balloons, and aircraft*).

Requirement 14. Proposals submitted in response to this AO shall be for complete science investigations requiring a spaceflight mission.



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## **Technical Requirements 14-30 on Section 5.2**

- 5.2.1 Complete Spaceflight Missions (5)
- 5.2.2 Accepted Management Processes and Practices (2)
- 5.2.3 New Technologies/Advanced Developments (1)
- 5.2.4 Use of Radioactive Material (2)
- 5.2.5 Telecommunications, Tracking, and Navigation (4)
- 5.2.6 Critical Event Coverage (1)
- 5.2.7 End-of-Mission Spacecraft Disposal Requirement (1)
- 5.2.8 Deviations from Recommended Payload Requirements (1)



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## **Management Requirements 31-39 on Section 5.3**

5.3.1 Principal Investigator (1)

5.3.2 Project Manager (2)

5.3.3 Management and Organization Experience and Expertise (2)

5.3.4 Risk Management (3)

5.3.5 Compliance with Procurement Regulations by NASA PI Proposals (1)

## **Science Team, Co-Investigators, and Collaborators Requirements 40-43 on Section 5.4**

5.4.1 Science Team (1)

5.4.2 Co-Investigators (2)

5.4.3 Collaborators (1)



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## **Cost Requirements 50-65 on Section 5.6**

- 5.6.1 PI-Managed Mission Cost and Total Mission Cost (3)
- 5.6.2 Cost of the Phase A Concept Study (2)
- 5.6.3 Cost Estimating Methodologies and Cost Reserve Management (3)
- 5.6.4 Work Breakdown Structure (1)
- 5.6.5 Master Equipment List (1)
- 5.6.6 Full Cost Accounting for NASA Facilities and Personnel (3)
- 5.6.7 Contributions (3)



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## **Proposal Preparation and Submission Requirements 81-85 on Section 6.2**

6.2.1 Structure of the Proposal (1)

6.2.2 Certifications

6.2.3 Submission of Proposals (1)

6.2.4 Electronic Submission of Proposal Summary Information  
(3)



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## **Proposal Evaluation, Selection, and Implementation** **(Section 7)**

7.1 Overview of the Proposal Evaluation and Selection Process

7.2 Evaluation Criteria

7.2.1 Overview of Evaluation Criteria

7.2.2 Scientific Merit of the Proposed Investigation (4)

7.2.3 Scientific Implementation Merit and Feasibility of the Investigation (6)

7.2.4 Feasibility of the Mission Implementation, Including Cost Risk (5)



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## **Feasibility of the Mission Implementation, Including Cost Risk:** **TMC Evaluation Criteria**

The technical and management approaches of all submitted investigations will be evaluated to assess the likelihood that they can be successfully implemented as proposed, including an assessment of the likelihood of their completion within the proposed cost and schedule. The factors for feasibility of mission implementation include the following:

Factor C1 - Adequacy and robustness of the instrument implementation plan.

Factor C2 - Adequacy and robustness of the mission design and plan for mission operations.

Factor C3 - Adequacy and robustness of the flight systems.

Factor C4 - Adequacy and robustness of the management approach and schedule, including the capability of the management team.

Factor C5 - Adequacy and robustness of the cost plan including cost feasibility and cost risk.





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## **Appendix B: Requirements for Proposal Preparation**

Appendix B contains the specific requirements for the format and content of Step 1 proposals.

General Requirements (B1-6)

Graphic Cover Page and Proposal Summary Information (B7-12)

Fact Sheet (B-13)

Table of Contents (B-14)

Science Investigation (B-15-18)

Science Implementation (B-19-25)

Missions Implementation (B-26-40)

Management (B-41-45)

Cost and Cost Estimating Methodology (B-46-51)

Small Business Contracting Plan, Acknowledgment of Education and Public Outreach, and Optional Student Collaboration (B-52-54)

Appendices (B-55-69)



# References

## Explorer Acquisition Home Page

An Explorer Acquisition Homepage, available at <http://explorers.larc.nasa.gov/EX/>, will provide updates and any AO addenda during the Explorer AO solicitation process. It will provide links to the Program Library, information about the preproposal conference, a list of potential proposers and teaming partners, and questions and answers regarding the AO.

## Program Library

The Explorer Program Library provides additional regulations, policies, and background information on the Explorer Program. The Program Library is accessible at [http://explorers.larc.nasa.gov/EX/ex\\_Library.html](http://explorers.larc.nasa.gov/EX/ex_Library.html)

## Lessons Learned from Technical, Management, and Cost Review of Proposals 2nd Edition

[http://sso.larc.nasa.gov/TMCLessonsLearned\\_Step1\\_Update\\_120409\\_2.pdf](http://sso.larc.nasa.gov/TMCLessonsLearned_Step1_Update_120409_2.pdf)



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## Future Additions to the AO

- None known at this time

## Ready to be added to Program Library:

- “NASA’s Mission Operations and Communications Services”



# Questions



# Supplemental Information



# TMC Evaluation Factors and Sub-Factors

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Generally, the degree to which Proposals address the following factors directly relates to the rating of Low, Medium, or High Risk:

- **Instrument**
  - Instrument Design, Accommodation, and Interface
  - Design Heritage
  - Environment Concerns
  - Technology Readiness
  - Instrument Systems Engineering
- **Mission Design and Operations**
  - Mass Margins
  - Trajectory Analysis
  - Launch Services
  - Concept of Mission Operations
  - Ground Facilities – New/Existing
  - Telecom
- **Flight Systems**
  - Hardware/Software Design
  - Design Heritage
  - Spacecraft Systems Design
  - Design Margins (Excluding mass)
  - Qualification and Verification
  - Assembly, Test, and Launch Operations
  - Mission Assurance
  - Development of New Technology
- **Management and Schedule**
  - Roles and Responsibilities
  - Team Experience and Key Individuals' Qualifications
  - Project Management and Systems Engineering
  - Organizational Structure and Work Breakdown Schedule (WBS)
  - International Participation
  - Risk Management, Including Descope Plan and Decision Milestones
  - Project-Level Schedule
  - Proposed Subcontracting Plans and SDB Participation.
- **Cost**
  - Basis of Estimate (BOE)
  - Cost Realism and Completeness
  - Cost Reserves by Phase
  - Comparison with TMC Estimates (Including Parametric Models/Analogies)

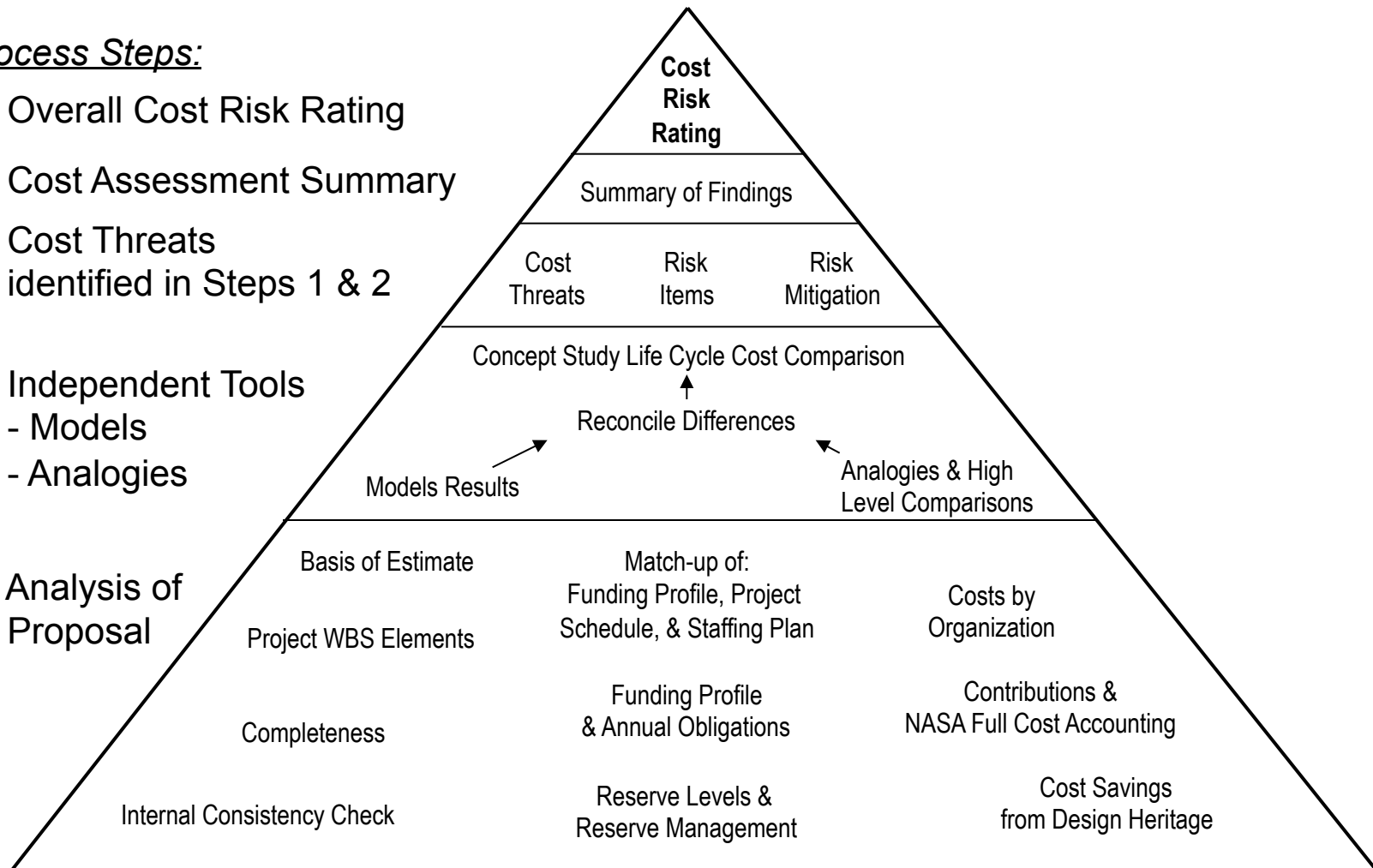


# TMC Independent Cost Assessment

## ***“The Pyramid”***

### Process Steps:

5. Overall Cost Risk Rating
4. Cost Assessment Summary
3. Cost Threats  
identified in Steps 1 & 2
2. Independent Tools  
- Models  
- Analogies
1. Analysis of  
Proposal





# Typical TMC Evaluation Questions

- Will overall investigation approach allow successful implementation as proposed?
- If not, are there sufficient resources (time & funds) to correct identified problems?
- Does proposed design/development allow the investigation to have a reasonable probability of accomplishing its objectives and include all needed tools?
- Are requirements within existing capabilities or are advances required?
- Does the proposal accommodate sufficient resiliency in appropriate resources (e.g., funds, mass, power) to accommodate development uncertainties?
- Is there a Risk Management approach adequate to identify problems with sufficient warning to allow for mitigation without impacting the investigation's objectives?
- Does the proposer understand the known risks, including risk of using new developments, and are there adequate fallback plans to mitigate them, to assure that investigation can be completed as proposed?





# Typical TMC Evaluation Questions

- Is the schedule workable?
- Does it reflect an understanding of work to be done and the time it takes to do it?
- Is there a reasonable probability of delivering the investigation on time to meet the proposed dates?
- Does it include schedule margin?
- Will proposed management approach (e.g., institutions and personnel, as known, organization, roles and responsibilities, experience, commitment, performance measurement tools, decision process, etc) allow successful completion of investigation? Is the PI in charge?
- Does the investigation, as proposed, have a reasonable chance of being accomplished within proposed cost?
- Are proposed costs within appropriate caps and profiles and does cost estimate cover all costs including full-cost accounting for NASA Centers?
- Are costs phased reasonably?
- Is there evidence in the proposal to give confidence in the proposed cost?
- Does the proposer recognize all potential risks/threats for additional costs or cost growth (e.g., late deliveries of components)?



# Characteristics of Low Risk Ratings

- All risks for the project have been/are being identified and managed by the team, with plans to reduce or retire the risk before launch.
- No risk exists for which neither a workaround is planned, nor a very sound plan to develop and qualify the risk item for flight.
- The proposed project team and each of its critical participants are competent, qualified, and committed to execute the project.
- The project will be self managed to a successful conclusion while providing reasonable visibility to NASA for oversight.
- The team has thoroughly analyzed all project requirements, and consequently the proposed resources are adequate to cover the projected needs, including an additional percentage for growth during the design and development, and then a margin on top of that for unforeseen difficulties.
- The schedule includes reserve time, to find and fix problems if things do not go according to plan.
- All contributed assets for the project are backed by letters of commitment.
- The team understands the seriousness of failing to meet technical, schedule, or cost commitments for the project in today's environment.



# Characteristics of High Risk Ratings

## Technical Design Margins (Mass, Power, etc.)

- Insufficient data provided from which to independently verify the margins.
- No margin provided or conflicting data provided.
- Margin provided deemed too low based on the maturity of the design.

## Cost

- Concerns relating to cost reserve (Below AO requirement, too low based on liens/threats, phasing inconsistent with anticipated needs).
- Unable to validate proposed cost

## Instrument Implementation

- Heritage claims not substantiated/development risks not adequately addressed.
- Inadequate/inconsistent description and detail.
- Inconsistencies between instrument requirements and bus capabilities.

## Complex Operations

- More common in payloads containing multiple instrument that required tight scheduling/sequential operations. Operations not adequately addressed.



# Characteristics of High Risk Ratings

## Systems Engineering

- Incomplete flow-down of science requirements to payload/flight system accommodations.
- Incomplete description of how the systems engineering function will be executed.
- Inadequate resources allocated to accomplish this function.

## Management Plans

- Confusing/conflicting organizational roles and responsibilities.
- Lack of demonstrated organizational/individual expertise for specified role.
- Insufficient time commitments for key personnel.

## Schedules

- Insufficient detail from which to perform an independent assessment.
- Inadequate/no schedule reserve identified.
- Overly ambitious schedules that are not consistent with recent experiences.